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of a dull bluish-white color, and slightly spotted with faint brown blotches. One of the eggs in my collection is of a dusky white color, slightly tinged with dull blue, with oblong blotches of greenish-blue, and quite granulated. The measurements of two taken from different localities are as follows: long diameter $2\frac{2}{10}$ inches, short diameter $1\frac{7}{10}$; the second one, $2\frac{1}{8}$ inches by $1\frac{5}{8}$ inches. These measurements are somewhat less, and the egg was less spherical, than the one described by Dr. Brewer in his *North American Oölogy*. After thirty years' observation and experience in ornithological and oölogical researches, I am satisfied that it is not wise to place too much reliance upon the measurements or number of eggs found in a nest. This is particularly the case with our rapacious birds. Take for instance the great horned owl. Audubon says that it lays from three to six eggs; another collector says it always lays two eggs. While this may seem inexplicable to some, it admits of a very easy solution. A pair of these birds will occupy the same piece of woods for years if not molested, and the collector who finds their nest will invariably find two eggs. I have found two, three, four, and five eggs in a nest of this bird in different localities. The old bird lays two eggs, while the younger bird lays the larger number and the smallest eggs. I have never seen these facts in print, and am not aware that they are known to oölogists, but they are based upon my observations and that of my collectors. They explain many seeming discrepancies, and for this reason I have digressed somewhat from my subject in order to give what I consider important facts to the oölogist, as this closes my series of articles on the game falcons of New England.

THE ORIGIN AND DEVELOPMENT OF MUSEUMS.¹

BY DR. H. A. HAGEN.

THE second part of the seventeenth century is remarkable for the formation of academies in nearly every great city, and some, principally in Italy, were founded even a century before. The first one, the *Accademia Secretorum Naturæ*, founded in 1560 in Rome, was soon suppressed by the popes as being dangerous. Of those founded in the seventeenth century, some were more successful, and the most prominent are still vigorous, as, for instance, the Royal Society in London, the Leopoldine Academy in

¹ Concluded from page 89.

Germany, and the Academy of Sciences in Paris. These three, founded nearly at the same time, between 1660 and 1670, have published their valuable transactions during two centuries, containing an immense number of facts and speculations which prove clearly that union is power. The facility of publishing isolated facts, otherwise lost, advanced science and her tools, the collections, in a remarkable degree. Naturally, from this time forth, new societies were founded year by year, all doing more or less valuable service.

In the mean time a very important discovery was made, that of the microscope. Formerly, natural history consisted only of observations made with the naked eye, but now the field of observation was enlarged in a manner not dreamed of before. Of course collections, becoming by degrees living archives of science, were allowed to be established on a larger scale.

It is well known that magnifying-glasses have been found among the Assyrian relics and the ruins of Pompeii, but the use of their magnifying power is nowhere recorded, though it is probable that some of the admirable gems of the ancients were cut with the help of lenses. Spectacles, perhaps in some way known in Rome, and even used by Nero, are said to have been invented at the end of the thirteenth century in Italy. Magnifying-glasses were manufactured by Arabians, and later by Roger Bacon, but certainly not used for the purposes of natural history before the beginning of the seventeenth century. Italy and Holland dispute the honor of the invention, which was perhaps simultaneous in the two countries. The great advantages of lenses for observation were directly acknowledged, and even augmented, by the invention of the compound microscope. Fontana in Rome and Drebbel in Holland are the rival inventors.

The old fame of Italy was now declining, and religious fanaticism hindered more and more the development of science. Unfortunately, also, the famous wealth of the Italian merchants was destroyed by the refusal of a number of prominent princes to pay their debts, enormous sums of money advanced by Italian bankers. These circumstances, together with the general change of the old routes of trade, gave an important advantage to the Dutch Protestants. The easily amassed fortune was largely used to advance culture and science, and the small Dutch country became for more than a century the leading nation in fashion, taste, and science, till her French and English neighbors put themselves somewhat roughly in her place. The particular taste

of the Dutch people for accurate and correct work in its exaggerated and pedantic character was well adapted for forming and arranging collections so rapidly acquired by a trade with the whole world.

Naturalists seldom equaled, never surpassed, belong to this interesting time, as Swammerdam, Leuwenhoek, Ruysch, Rumphius, Seba, and others. The observations and collections of microscopical objects by Leuwenhoek and Ruysch have till to-day a world-wide or rather a traditional fame, and are still preserved, partly in London, partly in St. Petersburg. Swammerdam himself gives an interesting account of his way of arranging and preserving the collections which were the pride and marvel of the country, seen and admired by prominent princes, who disputed among themselves the honor of acquiring them. This distinguished naturalist invented the mode of preservation of the most difficult objects by inflation, by drying, by injection, and by different chemicals.

The fame of the Dutch cabinets, as the most prominent of the time, induced Peter the Great to visit and study them carefully. A number of the most renowned, bought by him for enormous prices, were transferred to St. Petersburg to arouse an interest in such studies in his country. There are also a large number of more or less similar and expensive collections in France, Denmark, Germany, and England. The celebrated collection of Sir Hans Sloane was later the nucleus of the gigantic one of the British Museum.

Some details of the celebrated collections of Ruysch and Vincent in Amsterdam would perhaps be of interest as standard examples of the arrangement of collections at this time. The principal room is an immense hall, the high walls of which are furnished with columns, large windows in the upper part, with a gallery supported by caryatides, and the ceiling covered with rich frescoes. Shelves in the wall, or semicircular alcoves, were used for the exhibition of the objects. Large tables extending through the halls allowed of a far more detailed examination of the jars and boxes with which they were covered. Rooms connected with the halls were used for the cabinets, filled with drawers or glass jars symmetrically arranged. The latter contained birds, fishes, reptiles, the egg of a turtle with the embryo supported by the hand of a child, and a crocodile embryo in seaweed. The cover of the jar is of rich silk damask, fastened with elegant silk cords, the color of which is always reported in the

description of the collection, and on the top of the cover are groups of objects arranged in the most extraordinary way; the young of the obstetrical toad dancing on the nose of their mother in extravagant attitudes, butterflies and other insects flying about bouquets of dried flowers, shells grotesquely arranged in clusters and supported by pyramids of corals, and curious dried sea-fishes or sea-urchins are fastened on the top.

The whole arrangement was such as to please the eye of the visitor, often curious, even tasteless, but according with the fashion of the time, though scarcely ever scientific except that generally animals belonging to the same classes were brought together, if the size of the animals or glass jars in which they were placed allowed of it; but this was not often the case.

Printed descriptions with the most costly engravings of the contents of the collections were published, the repeated editions of which show the interest of the public. Some of them, for instance, the plates of the cabinet of Seba, in Amsterdam, were for a long time a principal authority in natural history, and the source from which naturalists obtained their knowledge. Indeed, this time is to be considered a forerunner of Linnæus in bringing together materials which he was to classify, and thus begin a new era in the study of natural history. Considerable progress is now to be noticed in the development of collections of natural history, as well as the attempt to arrange and preserve objects in a manner to secure them against a speedy destruction.

The objects preserved in alcohol are secured by large corks, covered again by different materials to prevent the evaporation of the preserving fluid. Delicate objects, such as shells and fine corals, were placed in drawers, fixed in the bottom in artistical figures, and the insects were mostly preserved in the same way. Insect-pins did not exist till a century later, and in their stead were used needles, and formerly thorns of plants, as we find them even now in the boxes arranged in China and imported from that country. The entire boxes were protected against dust or museum pests by glass covers; or else small boxes, each containing a few insects, or only one, were arranged in larger boxes, a custom prevailing as late as the beginning of this century.

The well-known naturalist, Petiver, pressed the insects as flat as possible, and fastened them between two plates of mica pasted together by slips of paper and fastened on a leaf folded on one side of a large book. This curious collection is still preserved in the British Museum.

The observation of the biology, and the study of the anatomy, of the objects now progressed rapidly with the help of the microscope, and the works of some prominent naturalists of those times are a source of information not yet exhausted. The names of Buffon, Réaumur, Degeer, Roesel, and many others are even now the pride of science in nearly every country. The middle of the last century begins the science of the present time with the immortal works of Linnæus; immense progress was made in the century after, which he foresaw, and it would be almost superfluous to dwell upon the merits of Linnæus.

But it seems to me that one of his innovations in science has a striking value for the advancement of collections, which has been, I believe, somewhat underrated. The invention and use of his binomial nomenclature allowed a scientific labeling of objects. Formerly all names of objects were designated by the so-called *nomen specificum* (now called a diagnosis), consisting of a dozen words. Linnæus' use of one name (he calls it a trivial one) for the species and one for the genus facilitated the labeling formerly so tedious and wordy. The advantage is obvious. The clear and logical mind of Linnæus not only purified the system, but also enabled him to purge the collections of a considerable number of fabulous and fictitious objects, sometimes a dangerous task. He was obliged to leave Hamburg suddenly, and by night, because he declared and proved the most expensive and rare object of the collection of the mayor of that city to be a fraudulent manufacture. It was a so-called hydra with many heads, the cranium having been made of weasels covered with snakes' skins. The mighty owner of this exceedingly costly object grew furious and threatened to imprison Linnæus as an impostor.

The "printed instructions" for the arrangement of a museum published by Linnæus in 1753 is the first really scientific essay, and has been followed by most naturalists. Indeed, even to-day we find the principles and rules of Linnæus more or less unconsciously followed in many museums.

Linnæus himself built at his country-seat, Hammerby, his museum, a small, square, brick building, on the top of a hill, with a beautiful view from his garden. I was fortunate enough, thirty-six years ago, to visit the place, just after the death of his youngest daughter. Everything was nearly in the same order as left by Linnæus. The collection and library, as is well known, were transferred to England. I saw them afterwards, one small cabinet containing the herbarium, and a similar one the insects

and shells. This souvenir of the great man fills the heart with awe, when one considers the small number of objects forming the basis of his studies and voluminous works.

Among the numerous museums which were arranged according to his system, and described by himself and his disciples, none gratified his pride more than the collection in the Jardin du Roi, in Paris, by order of the king, and against the wishes of Linnæus' celebrated antagonist, Buffon, the director of this institution. It will not, perhaps, be out of place to quote here an account of it given in 1780 by a prominent American, in the letters of President John Adams:—

“Yesterday we went to see the garden of the king, Jardin du Roi, and his cabinet of natural history, a great collection of metals, minerals, shells, insects, birds, beasts, fishes, and precious stones. They are arranged in good order and preserved in good condition, with the name of everything beautifully written on a piece of paper annexed to it. There is also a collection of wood and marbles. The garden is large and airy, affording fine walks between rows of trees. There is a collection from all parts of the world, of all the plants, roots, and vegetables that are used in medicines, and indeed of all the plants and trees in the world. A fine scene for the studious youth in physic and philosophy. It was a public day. There was a great deal of company, and I had the opportunity only to take a cursory view. The whole is very curious. When shall we have in America such collections? I am convinced that our country affords as ample materials for collections of this nature as any part of the world.”

The preëminent value of collections was first recognized when Sweden did not shrink from sending a man-of-war to recover the collections which had been sold in a legal manner to another country. The great advance made by Linnæus was followed by unusual exertions and struggles in nearly every part of the civilized world. Every country had disciples of Linnæus as leading naturalists. Everywhere collections suddenly arose, and only a score of years was needed to recognize that, with the excessive vigor of this time, science had bequeathed a new law of the highest importance for collections: the most careful preservation of described objects, nowadays called types. This new law, seemingly of very small importance, soon gained the most powerful influence over all museums, changing even their interior management and leading in a natural way to more appropriate arrangements.

It became necessary to give to one person the power to govern

and direct the whole; the old custom of having a board of patrons to decide matters concerning the internal management proved to be an impediment, sometimes even a nuisance. It must not be forgotten that, in a regular meeting, the Board of the Ashmolean Museum decided that the bird No. 31 should be thrown away as a rotten object. It was the last Dodo existing. Except in England, and its present and former colonies, such boards of trustees have been abolished.

The aim to preserve everything contained in collections soon demanded a new and most important officer, called conservator. His duty is manifold and burdensome, especially in a rapidly growing museum; the most varied kinds of work belong to him, but all centring in the effort to preserve the treasures of science. In fact, the business of this officer is an art in which there are various degrees of excellence, but in which, as in other arts, no degree of excellence is to be attained without training.

There are a number of scientific matters in which nearly everybody feels himself able to have and to express an opinion, as, for instance, scientific education, local geology, primeval history, management of libraries, and evolution. The arrangement of a museum belongs to the same category, to the detriment of science, which has lost often and heavily by such volunteer efforts. The importance of thorough training for this business is shown by a large and abundant literature. The development of the art of managing collections in the manner above stated was followed, curiously enough, in a natural way by the exclusion of the non-scientific public from them. The inevitable and perhaps irreparable loss of important specimens by persons not accustomed to handle such objects and ignorant of their value, together with the impossibility of securing all objects without impeding their exhibition, was the reason for excluding everybody except naturalists. If we consider that every kind of exhibition necessitates large expenses for large rooms, and for arrangements convenient if not showy, and that just this time of progress demanded immense sums of money, the expedient resorted to will be easily understood.

With few exceptions, perhaps, for a quarter of a century most museums became so exclusive that public admission was considered a hindrance or a nuisance. Even after attempts were made to give up this exclusiveness, something of it remained, and a natural consequence of this tendency was a sort of exclusiveness in the naturalists themselves, who stood aloof with their works

and collections for some time, till both were ready for the study and use of the public, just as an artist is not accessible till his work is accomplished.

The great impulse given to science by Cuvier was felt through the whole world, and every naturalist realized the necessity of a renewed and earnest study to enable him to follow the rapid progress of the master. The new way led directly to a comparative anatomy as basis for a comparative zoölogy. The admirable collections for this kind of study made and established in the Jardin des Plantes by Cuvier and his faithful associate, Laurillard, were at the time unrivaled, and show the immense amount of labor performed before the results could be published.

The aim of Cuvier was so expansive that even his masterpiece, the *Règne Animal*, was considered by him only as a tool necessary to be manufactured before he could work out the principles of natural history according to his ideas.

The result of this kind of revolution soon manifested itself in every museum, and the French ones under the eye of the master were far in advance. The new era developing the rights of man led directly to the necessity that everybody should be enabled to have his share in this advance of science. Museums were again thrown open to the public, and the peculiar taste for exhibition and show made the French museum, for more than a quarter of a century, the leading and most refined in the world; the other countries followed more or less slowly but steadily in their own way. It is a remarkable fact that even in the Jardin des Plantes, where the low, old-fashioned rooms were very soon overcrowded with objects, it was apparent that such a multitude of facts could be neither agreeable nor useful for public instruction. It was deemed advisable to prepare a separate collection, selected and arranged in a manner to be interesting to the public, which, being prepared according to French taste, was superior to all former ones. It is proper to mention here that just at this time, when Paris was the centre of science for the world, one of the most prominent of the army of ardent disciples of Cuvier was a young student from Neufchatel, Switzerland,—Louis Agassiz. The time of Cuvier is the date of the beginning of most of the large museums now in existence; some of them, indeed, were started before, but in a different and far inferior manner, so that few of the contents could be retained when the new start began which influenced so powerfully those of London, Vienna, Berlin, Copenhagen, Stockholm, Munich, and St. Petersburg.

It now became impossible for private collections to compete with the larger and steadily advancing museums, and the old custom which rich merchants had kept up for several centuries of accumulating collections began to disappear, and, to the detriment of science, was rarely renewed. Nevertheless, some of the old collections of this kind have lasted even to our times. Of private collections the museum of Sir Ashton Lever, afterwards, if I am not mistaken, united with the British Museum, was one of the most prominent, and some others known now only through printed catalogues were important.

The Ashmolean Museum, in Oxford, before it was transferred to the new rooms in 1861 was perhaps one of the most curious examples of the old style. Even in America, the East India museum in Salem, before the foundation of the Peabody Academy of Science, was a fair specimen of such collections of various objects of natural history, ethnological materials, and curiosities.

Private collections were now devoted to special classes or orders, according to the taste of the owner, and even often surpassed in their speciality larger museums. The impossibility of private students advancing natural history by means of large collections led quite naturally to associations and societies for this purpose, a considerable number of which were founded in nearly every country, so that science gained a large amount of facts, very prominent publications, and even more or less excellent collections. But soon most of them saw that their means were not adequate to their exertions. The collections suffered first, as it was not possible to maintain and preserve them in a scientific way. Later they grew to be a burden, and had to be given up more or less reluctantly, and the societies confined themselves to scientific work and publishing the results. There are a few exceptions where large means have been provided by patrons, and of these the Society of Natural History in Boston is the most prominent, and is unrivaled in its collection and manner of exhibition. Of course such societies have a task to accomplish which grows heavier every year. At any rate, science is much indebted to them for providing means for the publication of valuable matter which often would have been left unpublished without their generous help.

The public itself looked upon the ardent exertions of the naturalists with more curiosity than admiration, as the exclusiveness of science was the cause of a very moderate standard of general knowledge, till some of the most prominent workers found it

advisable to put the results of their investigations into a shape which could be understood by people not scientifically trained. The pride of the century, Alexander von Humboldt, led the long series of such publications, and the interest of the public, once awakened, exceeded all expectations, so that in later times the so-called popular literature of natural history equaled or even superseded the scientific publications. Of course every museum deemed it a duty to keep pace with this interest, and opened its doors to the public. At first, things went on to the satisfaction of both parties ; but by and by a natural change took place. The aim to exhibit the collections in a way pleasing and satisfactory to the public taste necessitated work often beyond the power of the officers, and to the scientific detriment of the collections. The buildings proved to be mostly too small, or at least not fit to exhibit the objects in a suitable way, and in the new ones the principal claim on the architect was often to satisfy the taste of the public by giving a beautiful view of the specimens, the interests of science being secondary. An imposing hall, with splendid galleries, staircases, and large, high rooms, was the basis of a plan for a museum. The specimens themselves were to be arranged more or less artistically : birds and butterflies first, fishes and crabs being condemned to the corners.

The three principal conditions of a building intended for a museum, convenient rooms, light, and the exhibition of the objects, had to be balanced in another way ; the exhibition, as well as the light, took the heaviest share ; and the latter being the greatest and most injurious enemy to the preservation of objects of natural history, the disadvantage for science increased in such museums beyond all measure. The necessity of securing specimens against injury augmented the expenses considerably, especially when all objects should be exhibited. Nevertheless the aim of public instruction could not often be attained in a way to match the exertions. The larger the collection, the smaller its value for the instruction of the public. The reason is obvious. Anybody obliged to pass about a quarter of a mile before cases with only water-fowls or sparrows, or to look at twenty thousand species of beetles of the same family, becomes bewildered and loses the connection between the different forms, the very thing for which he wished to see the museum.

Such large collections, which would be the pride and the aim of the scientific naturalist, are like a complete dictionary to the linguist ; but nobody, I believe, will undertake to read a dictionary

for pleasure or for general instruction. This somewhat hybrid tendency to satisfy at the same time science and the public proved to be detrimental to both these and the naturalist himself. Every country complained of the gradual conversion of scientific associations into popular audiences, with no scientific knowledge to speak of, and this had the usual effect even upon scientists.

The conclusion is very simple ; the desire of advancing science is very different from that of advancing the knowledge of the non-scientific public, and both cannot be attended to at the same time and with the same means, without hindrance and injury to one or the other. The importance of the separation of these two has, during the last score of years, been more and more fully acknowledged. The plans of several museums recently built were appropriate to different purposes, either scientific ones or those adapted to public instruction, and beautiful specimens of both these patterns are in existence.

It was certainly strange and unfitting to ask a naturalist to study in the same room an elephant and a small worm, so that rooms suitable for the best observation of both seemed to be a necessity. The plan of scientific museums provides for the comparatively small number of large animals large rooms or halls, and a series of small connected rooms, so that the different classes and orders may be kept separate, thus allowing a thoroughly scientific arrangement of the objects, not to be altered for merely showy purposes. The creation of a scientific museum requires long and hard labor of generations of naturalists, and unless scientifically separated, the largest accumulation of objects of natural history forms only a sort of store-house. A museum cannot be bought at once with money, but must be developed by steady work. The largest and most advanced museums in the world have been arranged by three or even four succeeding generations of naturalists, and are still more or less remote from the achievement of their intended perfection. The only way to hasten the work is to buy scientifically prepared collections, but the chance to do this is rare, and the difference between the objects bought and those not yet worked up often creates an unpleasant discrepancy.

The expedient of sending out persons to collect the natural objects of a number of countries for museums seems quite natural, and indeed has been resorted to in many cases. The financial result was generally unsuccessful, and the objects more expensive than the highest market price. No doubt such expeditions fur-

ther and advance science to a degree not to be attained in any other way, and should therefore not be done away with. But a museum dependent for its subsistence upon certain and regular funds would be able to undertake them only rarely, and with the generous help of patrons, as is done so successfully in this country.

On the whole, a well-managed museum hardly needs these extraordinary and irregular exertions, which always retard the progress of the institution. It should not be forgotten that a museum has a great advantage over a private collection, as it is generally of no great consequence if it waits years for a favorable chance to obtain certain objects, whilst a private collection can wait only during the life-time of its possessor, or rather during his working years.

Indeed, the overwhelming number of objects obtained during the last thirty years by the steadily increasing trade with the whole world has filled every museum to overflowing, and thus retarded its progress. The scientific work is still entirely unable to keep pace with the collector. The conscientious worker in a museum suffers every day the torments of Tantalus, having before him innumerable and most interesting objects for the furtherance of science, and for excellent publications. He must therefore content himself with only putting them in the right places and on the right shelves, and has no time for scientific work if he would fulfill his duty. He is surely pardonable if he occasionally revolts, although he finds his recompense in the conviction that he is working not only for himself but for others, for the advancement of science and of culture.

The sudden and unlooked-for enlargement of the collections has another equally unexpected consequence, which has not yet been accounted for. In former times most of the specimens were dried, and natural science came to be merely a knowledge of dried skins and dried animals, and the last great zoölogist who knew nothing but the skins of animals died only thirty years ago. The enormous expense of preserving objects in alcohol became more and more embarrassing, and a large part of the income of every museum had to be expended every year for this purpose. It is easy to calculate the time when a museum will be obliged to stop its work, and even be unable to preserve the objects already in hand. Various other liquids have been tried with more or less success, and finally the fact that objects preserved in a different way were generally unfit for comparison determined collectors to return to the use of alcohol.

Natural history still consists principally in the knowledge of dead and preserved animals as seen in the museums. Eventually zoölogy became a museum zoölogy. Every worker knows the difficulty of using scientific works in comparing living or fresh specimens, though he has no difficulty at all with such as have undergone the regular museum process.

It would be unfair not to acknowledge the steps now taken by naturalists to overcome this still enormous difficulty, and the real progress already made; but nevertheless it is certainly a great advantage to science that in every museum the objects are preserved in the same way. It is therefore clearly necessary to find the easiest means of reducing the evaporation of this expensive fluid, and this attempt has been made in all European museums during the last ten years.

We have now traced the development of collections of natural history to the present time. The separation of collections to advance science from those designed to advance general knowledge will be doubtless a permanent one, and is to be considered as a sign of real progress, as a benefit to mankind. The collections designed to advance science will be archives of all that has been done in science. The better the facts of science are preserved, the better the archives will be. These collections will have only an indirect advantage for the public, just as a book is of no use before one is able to read.

The noblest aim to be fulfilled by these scientific collections is to prepare the way and show how museums intended to advance knowledge, namely, collections for public instruction, can be made and arranged so as to be best fitted for their purpose. I believe that this way will not be difficult to discover, if the purpose and the aim are clearly defined. As text-books must be adapted to the degree of knowledge of the student who is to peruse them, so must museums correspond to the average standard of knowledge in the public which visits them; and as in text-books this standard may be placed somewhat above the average knowledge, so collections should be formed which would necessitate the public to adapt itself to a higher standard—a thing mankind is always inclined to do.

It will be found impossible to arrange museums exactly fitted for every kind of knowledge. As a certain limit must be given to them, it may be best to have at least one so-called epitome-collection, in which every beginner should find, as in arithmetic, the easiest means for acquiring further knowledge. The adoption

of such a principle in the arrangement of museums would be equal to the different grades of text-books for different classes of students. Only the great amount of money needed to make so many different collections, and the still greater expense of maintaining them at the proper scientific standard, will prevent the arrangement of such manifold collections, though it would be the best way to educate the public. As science is to become simpler at every step in advance, and to lift higher and higher the mystical veil now so impenetrable to those without scientific knowledge, we have a right to hope that hereafter the way indicated above will be made less expensive and rendered possible of attainment. Hence everybody is called upon to hasten the progress of science, as the most effective means for the advance of general knowledge.

LUBBOCK'S OBSERVATIONS ON BEES AND ANTS.

THE second of Sir John Lubbock's series of Observations on Bees, Wasps, and Ants has recently been published in the *Journal of the Linnean Society*, and the following extracts may give our readers some idea of the interesting nature of his observations, which simply require a little time and patience, and could be tested and extended by one not an expert in systematic entomology or the anatomy of insects. It is surprising that there are not more observers of the habits of animals in this country, among young people. The last thing taught in our public schools is the habit of observation, the only path to reflection as well as independence in thinking.

Lubbock's earlier papers tended to show that while bees do not communicate information to one another, ants certainly have this power. Now our author publishes a series of facts, diaries of the doings of bees, which show, in his opinion, "that some bees, at any rate, do not communicate with their sisters, even if they find an untenanted comb full of honey, which to them would be a perfect Eldorado. This is the more remarkable because these bees began to work in the morning before the rest, and continued to do so even in weather which drove all the others into the shelter of the hive. That the strange bees which I have recorded should have found the honey is natural enough, because there were a good many bees about in the room."

The following fact is mentioned by F. Müller as seeming also to show a limited power of communicating facts on the part of